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ABSTRACT

This paper discusses the development of computer-based business simulations designed to prepare high school students for entry-level jobs in business, and explores the implementation of feedback mechanisms in simulations. Reasons why simulations are an appropriate type of media for this application, the nature of feedback, and research on feedback are considered. An overview of the Classroom, Inc. Project is then presented, including descriptions of the computer-based simulations and activities augmenting the simulation. The following instructional goals and ways that the goals are addressed by the simulations are examined: (1) give students experience with the language of the corporate world; (2) give students a feel for the major structural features of a business entity; (3) introduce students to contingencies in the business environment; and (4) show students how these contingencies are related to each other and to the goals of the business entity. The benefits of using fiction to engage the learner are considered, and objectives for feedback mechanisms are listed. Two categories of feedback mechanisms are described: within-the-fiction feedback, including follow-up scenarios, qualitative variables, financial statements, and variable-based scenarios; and outside-the-fiction feedback, including text-based feedback, what-if analysis, student discussions, and teacher-guided discussions. (16 references) (MES)

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Title:

Multiple Feedback Mechanisms in a Business Simulation

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Introduction

For the last two years, we have been developing computer-based business simulations to help prepare high school students for entry-level jobs in business settings. In designing our simulations, we wanted to augment the simulated environment with additional instructional supports to bolster and focus student learning. Feedback mechanisms were seen as appropriate pedagogical tools, but ones that had to be used carefully to avoid destroying the seductive and instructional power of the simulation fiction. Unfortunately, the research literature was largely silent about the use of feedback mechanisms for simulations. The feedback mechanisms we developed were based on three principles. First, feedback mechanisms should support the user's intuitions about being a part of the simulation fiction. Second, feedback mechanisms should clarify misunderstandings and strengthen previous learning. Third, feedback mechanisms should help the learner generalize to similar situations. This paper explores the rationale and implementation of our feedback mechanisms to help other simulation designers think about these issues in their designs and to generate ideas to help form a research agenda on simulation feedback.

Why Simulations?

As any educational technologist knows, different instructional media are appropriate for different instructional needs. In preparing high-school students for entry-level jobs, we choose to utilize simulations because we felt that simulations would:

1. Provide a Learning Context

   High-school students get very little exposure to realistic business settings. By providing them with experience in a simulated business setting, students would gain an experiential understanding of that world.

2. Integrate Disparate Topic Areas

   One of the major weaknesses of the traditional classroom is that topic areas become artificially separated. For example, marketing and accounting are taught in separate classes. Because real-world businesses have to deal with many issues simultaneously, good business simulations force students to integrate different topic areas in realistic ways.

3. Demonstrate the Realistic Contingencies of the Workplace.

   At a minimum, simulations provide a realistic view of the cause and effect relationships in a particular environment. So for example, users of a business simulation will learn that if customers are treated poorly, revenues and profits will drop.

4. Motivate Students to Learn Basic Skills

   By being introduced to a realistic workplace, students will become more motivated to learn basic skills that are valued in the workplace (i.e., math, writing, presentation).

5. Show How Every Employee is Important to Business Success

   By getting a feel for how different functional areas must work together to make a business organization a success, students will learn how each job and each employee is vital to the health of any organization they might join.

6. **Empower Students**

   By putting the students in the role of the general manager and giving them decision-making authority and responsibility, students become energized to take control of their own careers.

7. **Elicit Critical and Creative Problem-Solving Skills**

   By practicing decision-making and seeing how different decisions have different, yet predictable, results, students learn the importance of critical analysis and creative problem solving.

Why Simulation isn't Enough

The simulation we've described in the seven points above could be designed to simply mirror the reality of a typical business environment. It would present the cause and effect relationships found in the real world and students would move through its simulated environment and attempt to discover these relationships. For example, by treating customers poorly several times in the simulated world, students are likely to discover that this type of action lowers revenues.

Unfortunately, a simulation that simply presents an analog of the real world will suffer from the same limitations the real world has in playing the role of educator. As people move through the real world they often fail to learn important relationships (e.g., shaking hands can spread the common cold), they often fail to put their knowledge into practice (e.g., washing hands before eating), they often learn things incorrectly (e.g., they learn that vitamin C prevents colds when it actually only lessens the severity of colds), and sometimes they even "learn" things that aren't true (i.e., superstitious behaviors).

Because experience really isn't the best teacher, we wanted to add mechanisms to our simulations to clarify and bolster student learning. We thus turned to the notion of feedback.

The Nature of Feedback

In its simplest form, feedback can be represented in the following way:

Organism's Action—— *followed by* —— Environmental Event

Feedback is some environmental event that follows an organism's action and can be used by the organism to evaluate the effects of its action. For example, a child who is scolded for making noise is receiving feedback that creating too much noise will lead to scolding and is an undesirable behavior.

Ever since human beings evolved to the point where they intentionally and systematically prepared their young for future roles in life, parents and other adults have utilized feedback to mold the behavior and clarify the knowledge of learners. When three-year olds approach an open fire or electric socket, parents provide feedback by yelling "stop." When one of these same three-year olds points to the postman and says "Dada," mother responds by saying, "No, that's the postman; daddy is in the kitchen."

Feedback doesn't have to be an intentional instructional event. As we mentioned earlier, the real world can provide feedback itself. The child who puts her hand in a candle's flame will get feedback that flames cause pain.

Because of the limitations of real-world learning, educators and parents use feedback to help learners avoid harm and speed the learning process.

The Research on Feedback

Despite feedback's long history, there is still confusion about how, when, and in what learning contexts to use it (Carter, 1984; Cohen, 1985). This is especially true in regards to uses of feedback in educational technology applications (Clariana, Ross & Morrison, 1992). Questions regarding the timing of feedback (e.g., immediate vs. delayed; Kulik & Kulik, 1988; Smith, 1988; Sturges, 1978), the control of feedback (e.g., student vs. external control; Sales & Williams, 1988; Belland, Taylor, Cameloa, Dwyer and Baker, 1985), the effect of the type of material to-be-learned (e.g., high vs. low cognitive load; Sales, 1988), and the effects of individual differences (e.g., locus-of-control, ability, sex; Clariana & Smith, 1989; Schimmel, 1988) make it difficult to offer a clear prescription on the proper utilization of feedback. In fact, even the primary effect of feedback is unclear. Some theorists emphasize the motivational influence of feedback, while others focus on the informational aspects (see Sales, 1988).

Despite the confusion, there are several overall guidelines that have been put forth based on the research on feedback (Carter, 1984; Cohen, 1985; Viau & Clark, 1987). First, feedback should generally be informative rather than motivational. Second, feedback for simple cognitive material should be administered immediately. Feedback for higher-level cognitive material should be delayed. Third, in most situations feedback should be just informative enough to provide knowledge of the correct response. However, when students make an incorrect response or the material is more cognitively demanding, they should be given more elaborate explanatory feedback. Fourth, for more advanced students, who may get frustrated with too much irrelevant 'noise,' feedback should be less extensive and more often delayed. Students of lesser achievement should be given knowledge of correct response, perhaps with additional motivational support; more elaborate feedback often overwhelms low ability students (Clariana & Smith, 1988). Fifth, in some situations it may be helpful to give students the option of receiving feedback.

Unfortunately, none of the research that generated these guidelines used comprehensive educational simulations as the instructional intervention. In fact, most of the work above uses rather simple or short educational interventions that differ significantly from the approach taken in simulations. Obviously, simulation designers will want to be cautious in utilizing this literature. Nevertheless, given that simulations present complex situations, the research might suggest that delayed and elaborate feedback be used. In the discussion below, this prescription is reinforced, though for different reasons than simply the complexity of the material.

Note that the dearth of empirical research on simulation design issues is not limited to th ~rea of feedback mechanisms. As Reigeluth and Schwartz have noted from their review of the lite..ure, "few empirically based prescriptions have been offered to guide the design of instructional simulations" (Reigeluth & Schwartz, 1989; p. 2). This lack may be indicative of the holistic nature of simulations and the fact that simulation design (i.e., creating a mimetic world) is more art than science.

Overview of the Project

In order to understand the rationale and operations of our simulation feedback mechanisms, an overview of the project is necessary. This is especially true because we don't implement our simulations as isolated instructional events. Rather, they are part of a larger, integrated educational program. Thus, our feedback mechanisms take many forms and are provided by many different instructional components.

The Classroom, Inc. Project is a collaborative effort of the New York City Public Schools, Morgan Stanley & Co., Inc., and Teachers College, Columbia University[1]. The overarching goal

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[1]Funding for the Classroom, Inc. project was made available through grants from Morgan Stanley & Co., Inc., The Morgan Stanley Foundation, The Mariposa Foundation, Louis Calder Foundation, Bear Stearns & Co., The Loews Foundation, Andrew W. Mellon Foundation, American Express, and Chase Manhattan Bank.

of the project is to prepare high school students for entry-level jobs in business settings, while increasing their future educational options. The project utilizes computer-based business simulations as an instructional anchor for student learning and as a logistical anchor for three other project components: mentorships, summer internships, and curriculum enhancements (See Appendix A).

Two business simulations have been developed: a service industry simulation (i.e., a hotel) and a manufacturing business (i.e., a clothing manufacturer). Each simulation has a total running time of about 10 hours for its computer-based component and is supported by other instructional activities so that the total instructional intervention for each simulation is spread over an 18-week semester, utilizing about 60 hours of instructional time (See Appendix B and C).

Each computer simulation utilizes the Windows 3.0 environment and Asymetrix's Toolbook development platform to combine graphics and text into a user-dominated exploration of the simulated business environment.

The instructional events and activities augmenting the simulation are crucial to the success of the simulation as a learning tool. We now describe each of these in detail:

1. Topic Introductions

   The simulation is preceded by class time that introduces the major topic areas to be covered in each simulation module. Teachers can organize this class time in any manner they think will be most effective. Note that major topic areas are delineated from the list of learning objectives. To give an example, Module 1 might focus on the Management and Marketing learning objectives.

2. What-if Analysis

   In each session of the simulations, students have to make numeric decisions, such as setting the price of a hotel room or determining how much to pay the housekeeping staff. To help the students understand the issues involved in making such decisions, a pre-programmed, what-if analysis spreadsheet is available. Students use this for a whole class period at the beginning of each module.

3. Simulation Play

   In teams of three or four, students play the role of the general manager of the simulated enterprise. Each simulation session runs 30 minutes, representing six months of simulated time. At the end of each simulated year—every two sessions—students get a printout of their financial reports, a status report, and text-based feedback on each multiple-choice decision they made.

4. Teacher-Guided Discussions

   After the students play the simulation for two contiguous days, the teacher leads a discussion of the major decisions the students faced in the focal topic areas (e.g., Management, Marketing).[1]

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[1]Note that the focal topic areas are represented in about 60 percent of the qualitative (i.e., multiple choice) decisions the students face. So for instance in the first session of Module 1, students might face 3 decisions on Management issues, 1 decision that focuses on Marketing, and one decision that involves communication skills. This allows the simulation to maintain its fidelity (i.e., having different types of things happening at once) while it enables the teachers to focus their lesson plans.

5. Student-Guided Analysis and Planning

   Students work in their teams analyzing their results from the printouts, and plan for their future simulation sessions.

6. Teacher Summary and Student Activities

   The teacher summarizes the focal topic area and provides an activity for the students to apply what they have learned.

7. Non-Computer Simulation Activity

   Because neither the computer nor the simulation is an appropriate learning tool for all circumstances and learning goals, we utilize non-computer exercises that are part of the simulation fiction, but are not part of the computer-based portion of the simulation. For example, students have to write a letter to the operating partners of the hotel persuading them to authorize renovations to the restaurant. This activity takes several days and is not amenable to the computer-based simulation format. Nevertheless, the results from this activity are input into the computer-based fiction so that students will see the effects of their work in the simulated world. For example, some teams will receive better restaurant renovations than other teams, ultimately leading to increased revenues and higher profits.

8. The Repeating Cycle

   After students complete the non-computer simulation activity, they again play the simulation for two days and follow that up with three days of classroom discussions and activities.

Unique Overarching Goals for Simulations

Simulations are qualitatively different than other instructional interventions. Where other interventions focus on small, often disparate elements to be learned, simulations aim to prepare students to perform in a particular environment or at least understand some of the important relationships within a particular environment.

In the Classroom, Inc. project, the goal is to prepare high school students for entry-level jobs in the corporate world. There is a hope that students who play the simulation will become more familiar with the language that is used in the corporate environment, the structure of a typical business organization, and general business operations.

In essence, we want students to know how to react to particular situations when they enter the workplace. We want the simulation to present such situations. Moreover, we want the students to understand the general issues inherent in such situations so that they can generalize to other similar situations. We aim to accomplish this in four ways:

1. Give students experience with the language (and attitudes) of the corporate world.
2. Give students a feel for the major structural features within any business entity.
3. Give students an introduction to a large number of general contingencies that operate in the business environment.
4. Give students a feel for how these contingencies are connected to one another and provide students with an understanding for how these contingencies are related to the important goals inherent to any business entity.

These learning mechanisms are based on the simple notion that creating a simulated world will help students learn about that world. Of course, creating a simulated world is not a simple task, nor are attempts to do so universally successful. Nevertheless, a large part of the success of a simulation depends upon how well the simulated reality can convey the important features of the real-world environment.

Each of these four areas will now be described in more detail.

Giving the Students Experience with the Language of Business

Experience with language and the attitudes inherent in a particular language swarm—in this case the language used in the business world—does more than simply lower the cognitive workload of students entering the workplace. In addition, language provides clues to the contingencies of the environment, especially the social environment of the workplace. For example, lets take a look at the language of the simulated marketing manager.

> "Advertising is only worth so much. If we don't treat our customers properly, we are going to lose occupancy rate, and if our occupancy rate falls, we're going to lose revenues. We've got to implement a customer-service training program for our employees right now! Sure, it will cost money, but it will be a good investment in our future."

This monologue is full of direct learning points:

- Advertising is valuable, but not infinitely so.
- Treating customers properly is essential to business success.
- Treating customers improperly lowers occupancy rate.
- Lowering the occupancy rate lowers revenues
- Et cetera...

In addition to the learning points directly obtainable from parsing the text, there are additional, more indirect wisdoms:

- The marketing manager is concerned about customers.
- The marketing manager is concerned about the business and is willing to make a speech about it.
- Employees sometimes need training to perform at their best, and this training is likely to benefit the business.
- It is bad to lower the revenues.
- Employees in organizations have control, or at least influence, over the success of the business.
- In the business environment, logical arguments are the norm and are a valuable tool in decision-making.

Major Structural Features in the Business Environment

At the macro level, all businesses do pretty much the same things for the same reasons. Businesses are concerned with making profits. Profits are generated by bringing in more money than is spent. All businesses have customers. People or organizations will only become customers if a business has a product or service that they want or need. Because of these inherent constraints on a business, different businesses tend to develop similar structural features. To create an interface with customers, most companies have a marketing or sales function. To keep track of the money situations, most companies have developed an accounting or finance function.

One of the goals of the project is to familiarize students with typical business environments. Part of this familiarization involves giving students an understanding of the operations and functions of

different organizational sub-units. For instance, students should understand what the marketing department does and why it does it.

Alternatively, these structural features can actually provide students with a reminder about some of the important goals of a business organization. For example, by highlighting the fact that the marketing department exists, students are reminded that customers are crucial to business success. In a sense, structural features provide students with redundant cues about why or how a business works. Note that due to the static nature of these structural features, their presence is not sufficient to create student learning. They must be integrated into the interplay of the cause and effect relationships of the simulated business.

To help students learn about the various functional areas in the business, we allow the students to take meetings with their senior staff. These senior managers each have responsibility for a major functional area: marketing, finance, engineering, human resources, etc. Managers talk about a particular issue from the perspective of their functional responsibility. For example, the finance manager tends to be concerned about cutting costs; the marketing manager is concerned with the customers; and the human resource manager is concerned about the employees of the firm.

Environmental Contingencies as Learning Objectives

In the Classroom, Inc. simulations, specific learning objectives focus on environmental contingencies and the causal effects of student behavior. For example, the following learning objectives are specified (among hundreds of others):

- Students will understand that successful companies understand and anticipate their consumer or client needs and develop products and services to meet those needs.
- Students will understand that managers can motivate their subordinates to be productive by treating subordinates fairly and equitably
- Students will understand that having raw materials available in inventory can lead to smoother and more efficient scheduling.
- Students will understand that good work in one job can lead to a promotion, more interesting responsibilities, and increased pay.
- In making decisions, students will gather the appropriate amount of information, recognizing that good decisions require sufficient information and that the process of gathering information requires an expenditure of time, effort, and sometime money.

Note that all of these objectives contains a direct or implied environmental contingency. In the first objective one contingency is, "If a company meets the needs of its clients, it will be successful." In the last objective one contingency is, "Gathering an appropriate amount of information will lead to good decisions."

The Network of Contingencies and Goal-Plan Hierarchies

If teaching the contingencies inherent in our learning objectives was sufficient to prepare students for the workplace, we could simply provide drill and practice instruction on the condition–action connection. For example, we could teach that meeting-the-needs-of-clients leads to increased-sales-revenues. There are several reasons that this is insufficient.

First, learning condition-action rules is boring. Students are not motivated by such sterile learning methodologies.

Second, the contingencies need to be interconnected. For example, in the hotel simulation, encouraging employees to treat customers properly leads to an overall improvement in customer service, which leads to an increase in occupancy rates, which leads to an increase in revenues,

which leads to an increase in profits. Actions in the real-world have multiple and often chained effects. Our teaching should convey this fact.

Third, the contingencies are worthless if they are isolated from meaningful goals. Businesses have a complex web of interconnected goals, as do the people that work in those businesses. In a sense, goals are what drive the contingency engine. This is true because actors (whether they are people or organizational entities) only act in the service of meeting goals. To illustrate these points, our contingency involving meeting-the-needs-of-the-clients will only by activated if other higher-order goals have been activated. If students don't know why they should meet client needs, they won't even try. We can trace a series of goal–plan steps that would activate the need for the condition of our contingency (i.e., meeting client needs):

- Profits are a paramount goal
  - Profits can be increased by raising revenues
    - Revenues can be increased by getting more clients
      - Clients can be obtained by attempting to meet their needs
        - Et cetera ...

Students who have internalized the higher-order goals of a business will better understand why they should take certain lower-order actions.

Note how the subgoals are not uniquely qualified to fulfill the superordinate goals. For example, raising revenues is not the only way to get increased profits. Thus, despite the simple instantiation described above, an understanding of business functioning requires a very complex goal-plan hierarchy, certainly one that could not be taught with any efficiency. Simulations provide a vehicle for communicating this complex web of understanding by enabling students to participate in goal-directed actions and thinking.

Finally, teaching singular, isolated contingencies is also insufficient because of the *inert knowledge* problem (Whitehead, 1929). As stated before, our overarching project goal is to prepare students for the workplace. In doing this we don't want to simply fill their heads with facts. Instead, we would like them to know what to do when they are faced with a particular workplace situation. Thus, our goal as instructional designers is to strengthen connections between workplace situations and appropriate cognitive activity and behavioral actions. We want to situate the learning (Brown, Collins, & Duguid, 1989) in the workplace, or at least in a simulated workplace that provides appropriate hooks into the cognitive processing of the learner—hooks that will be activated later when students enter the real workplace.

An example may be helpful here. Certain business operations only make sense when the higher-order goals of a business are understood. For example, to a naive student, it might not make sense for a company like L.L. Bean to give a customer a new shirt when a seam ripped in the old one after two years of wear. On the other hand, if the student understands that customers provide revenues, and happy customers provide more revenues, the L.L. Bean policy makes sense.

Any simulation that recreates the real-world environment with some fidelity will help the learner understand the major cause and effect relationships (i.e., contingencies) of that environment. This, of course, is one of the prime rationales for using simulations in the first place. Nevertheless, simulation designers can insure that these contingencies are understood by learners by demonstrating the interconnections between contingencies and goals.

In the Classroom, Inc. hotel simulation, we include an income statement that highlights the revenue-minus-cost-equals-profits notion and a balance sheet that highlights the asset-vs-liability-and-equity notion. Moreover, the students learn that their decision-making in all aspects of company operations affects these financial statements.

Creating a Dramatic Fiction

We have sketched a rough outline of some of the theoretical-based rationales for our simulation design. Now we turn to a more holistically-based rationale, but one we think is equally as compelling.

From a user-interface perspective–arguably the most important perspective for instructional design–the defining characteristic of a simulation is that it creates a fiction! Not a fiction in the sense of untruth, but rather a fiction in the sense of a coherent, realistic interplay of characters and events. Thus, a simulation should create a realistic, coherent world that plays out like an interactive theatrical performance in which the user plays the role of the protagonist. The simulation should encourage users to get lost in the fiction (see Laurel, 1986).

The importance of fictionality is twofold. First, it is motivating and interesting. It encourages users to attend to the environment and experience their situation holistically (i.e., realistically). Second, the fiction provides a flow of events that is at least partially isomorphic to the world for which the students are being prepared. The goal for the designer is to insure that the user gets lost in the fiction, at least for a while. Anything that takes away from this first-personness or the seductive fidelity of this theatrical experience should be avoided.

The Classroom, Inc. Feedback Mechanisms

We have now reviewed some of the rationale we used for designing the Classroom, Inc., simulations. Based on these design imperatives, we wanted our feedback mechanisms to do the following:

1. Feedback mechanisms should support the user's intuitions about being a part of the simulation fiction.
2. Feedback mechanisms should clarify misunderstandings and strengthen previous learning, especially in regard to the environmental contingencies we want students to learn.
3. Feedback mechanisms should help the learner generalize to other similar situations.

Alessi & Trollip (1985) delineated two forms of feedback in simulations: natural and artificial. Natural feedback is representative of real-world cause and effect relationships (i.e., it is the effect), whereas artificial feedback is provided as a supplement to those realistic, simulated relationships. This distinction is useful because it describes how feedback can originate from the simulation model (i.e., the cause and effect relationships) or as augmentation to that model. However, as our experience will suggest, a second dichotomy may be more useful from a design perspective.

In keeping with our goal to keep the user's head in the simulation fiction, we found it useful to make a distinction between instructional feedback events that occur within-the-fiction and those that occur outside-the-fiction. Note that the distinction between "natural and artificial" is not the same distinction as "within and outside." Both natural and artificial feedback events can take place within and/or outside the fiction.

To illustrate this point by citing our simulations, an artificial index (e.g., hotel elegance) is made to feel a part of the fiction and a naturalistic model with implicit feedback (e.g., what-if analysis) is utilized outside of the simulation play.

To reiterate, fictionality is vital because it is motivating and provides students with enough experiential fidelity (i.e., the sense that they are part of a coherent, realistic world) to create transfer to the real world being simulated. Feedback mechanisms should be designed to maintain fictionality at the same time they augment the experiential learning process.

Utilizing the dichotomy between within-the-fiction and outside-the-fiction, we now turn to the feedback mechanisms used in the Classroom, Inc. simulations:

Within the Fiction

- Follow-up Scenarios
  (specific, realistic effects of multiple choice decisions)
- Qualitative Variables
  (indices of important business concerns)
- Financial Reports
  (cumulative financial effects result in changes on the income statement and balance sheet)
- Variable-based Scenarios
  (cumulative financial effects activate scenarios)

Outside the Fiction

- Text-based Feedback Report
  (specific feedback on multiple choice decisions)
- What-if Analysis
  (to see the financial effects of changes in numeric business decisions and qualitative variables)
- Student Discussions
  (students provide each other with additional feedback)
- Teacher-Guided Discussions
  (teachers lead discussions on simulation scenarios)

Each of these will now be discussed in more detail.

Feedback Within the Simulation Fiction

As we described above, the simulation fiction provides feedback that feels naturalistic, especially in its emphasis on demonstrating real-world contingencies. In other words, student actions have realistic effects. This naturalistic feedback is vital to simulation design. In fact, if you don't have this type of feedback, you don't really have a simulation.

Feedback within-the-fiction should feel naturalistic, but it doesn't have to have a precise real-world analog. For example, in the Classroom, Inc. hotel simulation, students are given an index that measures worker morale on a 1 to 100 scale. Worker morale is a realistic concept, but having it measured on a 100 point scale is not likely to be part of a general manager's everyday experience. Thus, having a worker morale index is artificial, but it works within a coherent fictional framework because worker morale is a concept that is meaningful to students and consistent with the real-world environment.

We must add a caveat here in regard to the fidelity of simulation feedback. Although one goal is to provide naturalistic feedback, often this feedback must be a less transparent version of the contingency in the real-world environment. For example, in a real-world situation in which a person makes a social faux pas, he might not learn the link between his actions and some delayed consequences—he may not understand why he is overlooked for promotion. In the simulation, the link has to be made more explicit. One way to accomplish this is to make the naturalistic feedback more potent or more direct. A second way to make this more apparent would be to add feedback outside the fiction.

The Classroom, Inc. simulations utilize four major forms of within-the-fiction feedback: follow-up scenarios, qualitative variables, financial statements, variable-based scenarios.

Follow-up Scenarios

Student responses to multiple-choice questions usually activate additional scenarios. For example, in the hotel simulation, if students fire their excellent food & beverage manager, they will then find themselves faced with the deteriorating performance of their restaurant. Specifically, a scenario might appear that has customers complaining about the food and the service, employees quitting, and restaurant costs rising. This type of feedback demonstrates the realistic contingencies in the workplace in a very powerful way—students who are involved in the decision-making get to see the results of their own actions.

Qualitative Variables

Using an object-oriented programming approach, a small set of variables are tracked during the simulation. These variables are chosen because they are meaningful to the industry being simulated and because they are relevant to the learning objectives. For example, in the hotel simulation customer-service, worker-morale, hotel-elegance, and occupancy-rate are used as qualitative variables. By playing the simulation, students learn that customer service is important in determining occupancy rate and occupancy rate is important in determining revenues. Moreover, because these variables are highlighted on the status report, the students come to realize that these are important goals to bear in mind as they work through their decision-making processes.

This feedback is available during the simulation in the form of the company's status report, but it is also printed out for the students later at the end of the simulated year (i.e., every two sessions). Students often view this feedback during play, without any apparent break in the fiction.

Financial Statements

As in most business simulations, students receive an income statement and balance sheet at the end of each year to help them understand the bottom-line financial effects of their decisions. This type of feedback provides breadth by acting as a summation of student responses. It also encourages students to stay focused on some of the primary goals in business; namely revenues, costs, and profits.

Variable-Based Scenarios

As described above, the qualitative variables (e.g., customer service, occupancy rate) are tracked in real time, using an object-oriented programming approach. Scenarios can be activated based on the level of these variables. For example, if worker-morale drops below 30, a scenario might be activated in which the human resource manager sends the users a report describing increased employee turnover. Employees might appear in the lounge, complaining about the miserable state of the company and the poor management. Like the financial statements, this mechanism provides feedback based on a trend of accumulated responses. Unlike the financials, this feedback is more specific to the day-to-day activities within the simulated company. This type of feedback highlights the instantiation of the qualitative variables, showing students the realistic effects of changes in these factors.

Feedback Outside of the Simulation Fiction

As we described above, the most important feedback for a simulation is that feedback which is a natural part of the simulated environment. Nevertheless, simulations should be augmented with additional feedback to increase the effectiveness and efficiency of the simulation in providing redundant clues to the users. Similarly, the simulation should provide additional feedback to help the students generalize their learnings to other contexts beyond the particular situation they were faced with in the simulation.

Like in the real-world environment, students moving through the simulation may miss or misunderstand some of the learnings they are given an opportunity to internalize. To combat this tendency, outside-the-fiction, elaborative feedback can provide additional acquisition opportunities and clarify misunderstood concepts.

The simulation should also help the students generalize appropriately. For example, suppose a simulated employee yells at a customer, and the student users appropriately fire that employee. Suppose that a similar situation occurs in the future and the students inappropriately fire the employee. The only difference in these situations is that in the second case the employee was brand new and hadn't taken the customer-service training course. The key here is that outside-the-fiction feedback could be used to help the students understand the critical issues, discriminating one situation from another based on subtle differences.

The simulation should also help the students understand the higher-order goals they can use to generate reasoned actions in future unfamiliar contexts. Feedback can include general, goal-based principles that will encourage the acquisition of non-situation-specific concepts. For example, suppose a simulated customer is quoted a room rate of $25 per night—well below the standard $85 per night. The students decide to charge the customer $85 because they feel the $25 is clearly a mistake the customer should have recognized. Of course, the customer gets angry and walks out. By including feedback that includes the general principal, "go-out-of-your-way-to-please-the-customer" and and its goal-based rationale, "because-customers-provide-revenues," the learning is likely to transfer to a situation in which a customer wants a non-perfumed soap.

The Classroom, Inc. simulations utilize four major forms of outside-the-fiction feedback: text-based feedback, what-if analysis, student discussions, teacher-guided discussions.

Text-Based Feedback to Multiple Choice Questions

Text-based feedback is provided for each multiple-choice alternative the students might choose. This feedback is available on-line after a decision is made and is printed out at the end of each simulation session. This feedback not only provides information about the correctness of the students' response in a particular situation. It also provides a general rule and a contextualized understanding of the principle involved. In other words, the feedback describes when, where, and why the response is good, bad, or mediocre. In addition, this feedback details the likely effects of the decision on the internal health of the organization (i.e., as measured by the qualitative variables) and the financial health of the organization (i.e., as described by revenues, costs, and profits).

Although this feedback is available during the playing of the simulation (i.e., during the fictional drama), students are discouraged from looking at it then because of the aggressive demand on their time and the fact that they will receive a hard copy of it later to peruse at their leisure.

What-if Analysis

The What-if Analysis provides students with a way to get feedback about their numeric business decisions (e.g., price of rooms, budget for advertising, salary for housekeepers). By trying different decisions and seeing how these decisions

might affect their income statement and balance sheet, students learn about the subtle relationships involved in quantitative decision-making. For example, by trying different pricing strategies (e.g., same as competitor, higher than competitor) students will learn how their pricing effects the demand for their service (or product). The What-if Analysis also enables students to see what will happen if they raise or lower their qualitative variables. For instance, students can see what will happen to their revenues if customer service increases, or they can see what will happen to their profits if occupancy rates go up.

The What-if Analysis is available during the simulation sessions, but it is rarely accessed by students because it takes too much time to iteratively attempt different what-if analyses. Students are given a separate day to use the What-if Analysis to help them prepare for the numeric business decisions they face in the simulation.

Student Discussions

Students working in teams provide feedback to each other both during the simulation play and afterward in team meetings where they analyze their results and plan for the future. Different perspectives are considered as students are encouraged to take everyone's ideas into account. These discussions help students link their understanding of the learning points to ideas they might not have otherwise considered.

During the simulations the students argue and discuss the decisions that face them as they cooperatively play the role of the general manager. Although this is not true to the fiction in that multiple people are playing the role of one person, because students are discussing situations that are within the fiction the flow of dramatic events remains intact.

Additional student discussions occur after the simulation play when teammates analyze their various feedback reports and plan for future simulation sessions. These discussions occur after the simulation play and thus do not interfere with the flow of the dramatic fiction.

Teacher-Guided Discussions

Teachers discuss several of the major qualitative, multiple-choice decisions the students dealt with in the most recent simulation sessions. They use this opportunity to clarify points or focus student thinking toward certain learning objectives.

These discussions occur after the simulation play and thus do not interfere with the flow of the dramatic fiction.

Summary

Feedback mechanisms have not been well researched for instructional simulations. Simulation designers must rely on their experience or theoretically-driven notions in providing feedback to users. This paper discussed the rationale for the design of the Classroom, Inc. simulations and their accompanying feedback mechanisms. The notion of fictionality was offered as a way of conceptualizing and planning feedback for simulations. Specifically, it was suggested that feedback mechanisms should be designed to balance the need to maintain the user's intuition about being a part of the simulated world and the need to bolster and clarify specific learning points.

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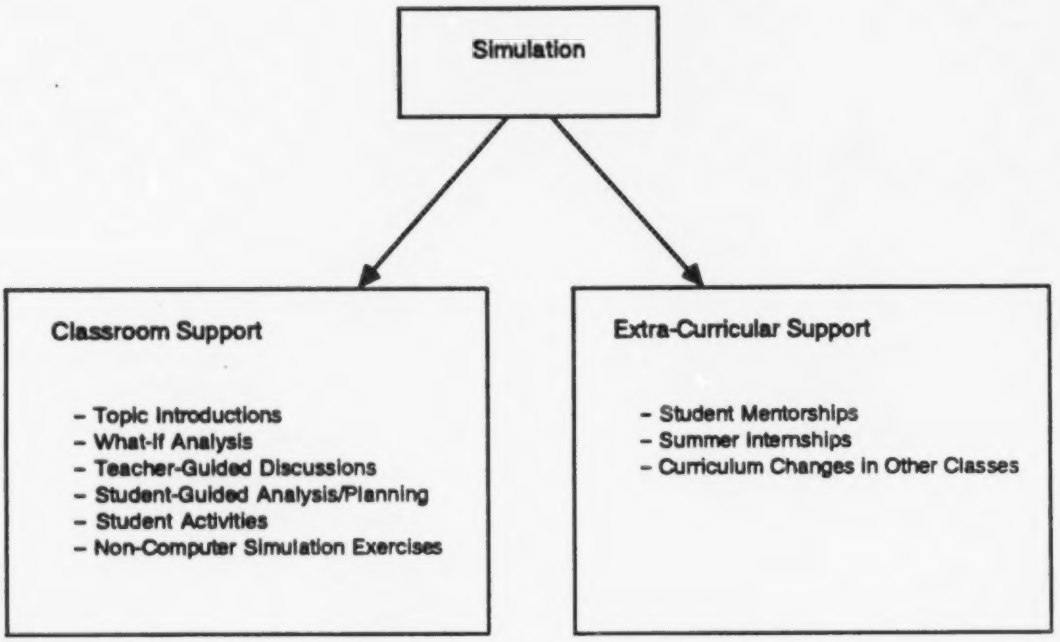
Simulation
Classroom Support
- Topic Introductions
- What-If Analysis
- Teacher-Guided Discussions
- Student-Guided Analysis/Planning
- Student Activities
- Non-Computer Simulation Exercises
Extra-Curricular Support
- Student Mentorships
- Summer Internships
- Curriculum Changes in Other Classes

Appendix A

Semester Schedule

1	Course Introduction	Module 3 Introduction	10
2	Module 1 Introduction	Module 3	11
3	Module 1	Module 3	12
4	Module 1	Module 3	13
5	Module 1	Module 4 Introduction	14
6	Module 2 Introduction	Module 4	15
7	Module 2	Module 4	16
8	Module 2	Module 4	17
9	Module 2	Presentations	18

Appendix B
811

Simulation Module (long)

monday	tuesday	wednesday	thursday	friday
What-if Analysis Play	Simulation Play	Simulation Play	Teacher-Guided Discussion	Student-Guided Analysis
Simulation Week 1				

monday	tuesday	wednesday	thursday	friday
Student Activities/ Teacher Summary	Non-Computer Simulation Exercise	Non-Computer Simulation Exercise	Non-Computer Simulation Exercise	Non-Computer Simulation Exercise
Simulation Week 2				

monday	tuesday	wednesday	thursday	friday
Simulation Play	Simulation Play	Teacher-Guided Discussion	Student-Guided Analysis/ Planning	Student Activities/ Teacher Summary
Simulation Week 3				

Appendix C

812